REMARKS

The application has been amended and is believed to be in condition for allowance.

Claims 1-32 were examined.

Claims 33-34 are new. No new matter is introduced by these claims.

There are no outstanding formal matters.

Rejections Under 35 USC 102, 103

Claims 1-5, 8, 10 and 12-32 were rejected under section 102 as anticipated by SUZUSHI 2002/0110651.

Claims 6 and 7 were rejected under section 103 as obvious in further view of NIKOLOV 2004/0095637.

Claim 9 was rejected under section 103 as obvious in further view of the Admitted Prior Art.

Claim 11 was rejected under section 103 as obvious over SUZUSHI alone.

Amendments to Claims 1 and 21

Claims 1 and 21 are independent. Claims 1 and 21 have been amended to clarify that the micro-relief pattern has a predetermined distribution across the encoding surface.

As claimed, the invention produces an image which can be viewed and which has different distinctive regions in it. This applies both for the diffracted image (the recited first image) and the polarisation image (the recited second image).

An important fundamental of the present invention is that the micro-relief pattern not only produces a diffracted image but, and that by its interaction with the optically anisotropic material whereby it induces areas of different polarisation modulation, so that both a polarisation image and a diffracted image can be viewed.

In view of these amendments, each of the independent claims is believed patentable. The dependent claims are believed patentable at least for depending from an allowable claim.

In Suzushi the liquid crystal material is a cholesteric material. In a cholesteric liquid crystal material, the molecules align essentially helically in subsequent layers to produce a structure which provides <u>circular</u> polarisation. The optical axis in such a material extends vertically through the surface. Thus, it is <u>not</u> possible to induce changes in the orientation of the optical axis using an underlying alignment structure.

By contrast, the present invention provides liquid crystals of the type that align their molecules with the direction of the grooves in the underlying micro-relief structure.

Once the lowermost layer of needle-shaped molecules has aligned with the direction ordained by the direction of the grooves, in subsequent layers, the molecules align in the same direction by virtue of the alignment of the underlying layer, and

so on. In this type of material, the optical axis lies in the plane of layer and is determined by the direction of the grooves. Thus, the underlying structure can orient the optical axis, in the plane of the device, at any angle from 0° to 360°. The present invention therefore gives a structure in which the micro-relief pattern both produces a diffracted image, dependent upon the pitch, geometry, orientation of the grooves and a polarisation modulation which also is determined by the direction of the grooves and the thickness of the layer.

Claims 33 and 34 to make clear that the liquid crystal material has a planar orientation with the optical axis lying parallel to the surface and with the optical axis following directions of the predetermined spatial distribution of said micro-relief pattern. No new matter is entered by way of this amendment. This structure is known in the nature of the type B devices described in the introduction and heavily referenced there and elsewhere in the specification. Further, there are several references to the device of the invention exhibiting type A and type B effects, for example on page 20 lines 8 to 11 it states '*the whole device works both as a diffractive device (type A) and also as type B when viewed appropriately. In the case B the modulation of the polarisation follows the orientation of the diffractive pattern.*' There are references in the description of the preferred embodiments to type B devices on page 19 line 12;

page 20 line 9; page 22 line 18; page 24 line 17; page 30 line 7, line 12, line 14 and line 16.

Suzushi does not anticipate or render obvious the recited invention.

As introduced above, Suzushi is concerned exclusively with optical laminates including a novel cholesteric liquid material (see paragraph [0001] and claims). It is well known that a cholesteric liquid crystal is a type of liquid crystal with a helical structure. They organize in layers with no positional ordering within the layers, having a director axis which varies between the layers. The variation of the director axis tends to be periodic in nature so as to vary helically through the layers. A cholesteric liquid crystal applies circular polarisation. It is clear from Suzushi (see [0003] and [0004]) that he is concerned with providing a laminate of cholesteric liquid crystal material to provide diffractivity in combination with circular polarisation properties.

Suzushi explains that in conventional diffractive elements natural light from a light source is spectrally split by a diffraction element and then allowed to pass through a polariser. The problem with this method is that about 50% of the resulting diffracted light is absorbed by the polariser. It is clear from the introduction and the remainder of the specification of Suzushi imparts a uniform polarisation to the radiation past by the optical laminate. Suzushi makes no

suggestion that the polarisation might be modified across the aperture of the laminate. Indeed, given that the polarisation applied is circular, it would not be practical to try to impose a polarisation modulation that varied across the surface.

Note that Suzushi does refer to linear polarisation in the final line of [0003] but later in the specification it is clear that this is achieved by applying a quarter wave retardation plate to the laminate so as to provide, again, a uniform polarisation.

In the present invention, the inventor has invented a device in which both the polarisation image and the diffracted image vary spatially across the image.

Suzushi fails to disclose an arrangement in which the polarisation image varies spatially; to provide a polarisation image which varied spatially would be counter to the presumption of uniformity of polarisation which runs through his specification. Furthermore, given the innate characteristic of a cholesteric liquid crystal material, it is not possible to apply a polarisation modulation by means of a micro-relief pattern. In a cholesteric liquid crystal, the polarisation modulation is either left, or right polarisation. It is not possible to induce local orientation of the liquid crystal structure in the same manner as in the present invention.

Thus, for these reasons the independent claims are patentable.

Further, claim 33 is also patentable in its own right. Claim 33 is distinctive regarding materials as Suzushi only uses Cholesteric Liquid Crystal materials (with helical orientation).

Although in the independent claims recite general optically anisotropic materials which can align to a surface with a diffractive structure, claims 33, 34 are specific to a liquid crystal material with <u>planar</u> orientation.

The choice of materials imposes clear differences in the structure of the device and the way it functions. In Suzushi the Cholesteric LC materials have a helical structure where the helical axes (hence the Cholesteric optical axes) are substantially <u>perpendicular</u> to the surface (Suzushi calls this the direction of the thickness of the film). In this case the alignment structure on the surface is merely used to anchor the helix. It is clear from Suzushi that one and only one polarization (e.g. circular with a specific handedness) can emerge from this arrangement even from regions where diffractive structure was introduced to the film and the helical axes are no longer homogeneously parallel as he claims (see Suzushi 96 and 97). Indeed, there is not even a hint anywhere that there is any form of variation of polarisation across the surface. Even the handedness of the polarisation and the pitch of the helical structure are pre-determined by the choice of the chiral dopant.

In the case of using liquid crystal materials with planar (as distinct from helical) orientation, the molecules of

the liquid crystal materials are homogenously aligned with their molecular long axes substantially parallel to the surface and substantially parallel to the directions of the grooves or micro-relief diffractive structure. This means that the optical axis is also substantially parallel to the surface and substantially follows to the directions of the grooves or micro-relief pattern diffractive structure. Hence there is produced linear polarisation (in any planar direction) with a specific film thickness as explained in the specification. Moreover, the directions of the linear polarisations vary spatially as they follow the directions of the micro-relief structure on the surface.

In summary, the claims now recite that the anisotropic materials are liquid crystal materials (e.g., claims 1, 21) with planar orientation and that the optical axis is parallel to the surface (e.g., claim 33, 34). These features clearly distinguish over Suzushi.

As neither SUZUSHI nor the other applied references teach or suggest the claimed invention, the claims are all believed patentable. Reconsideration and allowance of all the claims are respectfully requested.

Should there be any matters that need to be resolved in the present application; the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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